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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,350	07/29/2003	Masanori Fukui	238236US-2X	4502
22850	7590	09/20/2006	EXAMINER	
C. IRVIN MCCLELLAND OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			DEGHAN, QUEENIE S	
			ART UNIT	PAPER NUMBER
			1731	

DATE MAILED: 09/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/628,350

Applicant(s)

FUKUI ET AL.

Examiner

Queenie Dehghan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The added limitation of controlling electric current to the electrodes does not appear to be mentioned in the original specification. There does not appear to be any controller or specific controlling steps mentioned, such as controlling voltages and current. If the applicant feels that this is in error, please point out the specific page and line numbers where the new limitation is recited.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-3, 5, 7-8,10, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honma et al. (JP Abstract 2001-002430) in view of Chenoweth (6,044,667) and Williamson (4,531,218). Honma et al. disclose a process for producing a quartz glass crucible for pulling up a single crystal silicon comprising forming a body 14 having a crucible shape, arc melting the formed body to obtain a quartz crucible, mechanically grinding the inner surface of the crucible and then remelting the inner surface by arc melting so as to reform the surface and eliminate residual air bubbles. Honma et al. fail to disclose specifics of the arc discharging electrodes used. Chenoweth teach the use of several electrodes positioned around a rotational axis, in which the neighboring electrodes are positioned at regular intervals from each other in a ring-like configuration forming a stable ring-like arc between the neighboring electrodes and without generating a continuous arc between electrodes facing each other across a central portion of the ring-like configuration (Figure 1A col. 4 lines 45-48). Furthermore, Chenoweth teach positioning the electrodes so to have an absolute value of a phase difference of  $120^\circ$  (see path of heating current connect three electrodes ( $360^\circ$  divide by 3 =  $120^\circ$ , Figure 3, col. 6 lines 54-57) and forming a circle with a radius that is at least  $\frac{1}{4}$

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of the radius of an open portion of the crucible (col. 4 lines 48-50, col. 7 lines 23-25). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the electrode arrangement of Chenoweth in the process of Honma et al. in order to control a high temperature arc discharge to a large diameter crucible for even heating. Furthermore, neither Chenoweth nor Honma et al. teach controlling electric current to the electrodes. However, Williamson teach electrodes used in a glass melting receptacle wherein the electric current to the electrodes are controlled with a controller (col. 1 lines 53-54, 59 to col. 2 lines 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the step of controlling electric current to the electrodes, as taught by Williamson, in the process of Honma et al. and Chenoweth, in order to balance the temperature of the molten glass.

4. Claim 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (JP Abstract 02-188489) or Honma et al. (JP Abstract 2001-002430) in view of Chenoweth (6,044,667) and Williamson (4,531,218). Watanabe et al. disclose a process for pulling up a single crystal silicon and regenerating a quartz glass crucible by grinding foreign substance on an inside surface of the crucible and fusing the inside surface of the crucible to be smoothed with an arc discharge generated by an electrode (abstract). Honma et al. disclose a process for pulling up a single crystal silicon comprising heating the inside surface of a rotating crucible by arc melting, removing foreign substance and bubbles located under the inside surface and re-melting the inside surface of the crucible to be smoothed (abstract). However, Watanabe et al. and Honma et al. do not disclose specifics of the electrode used. Chenoweth teach the use

of several electrodes positioned around a rotational axis, in which the neighboring electrodes are positioned at regular intervals from each other in a ring-like configuration forming a stable ring-like arc between the neighboring electrodes (Figure 1A col. 4 lines 45-48). Furthermore, Chenoweth shows in figure 3, a ring like arc between neighboring electrodes, without generating a continuous arc between electrodes facing each other across a central portion of the ring-like configuration. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the electrode arrangement of Chenoweth in the process of Watanabe et al. or Honma et al. in order to control a high temperature arc discharge to a large diameter crucible for even heating. Furthermore, Watanabe et al., Honma et al., and Chenoweth fail to teach controlling electric current to the electrodes. However, Williamson teach electrodes used in a glass melting receptacle wherein the electric current to the electrodes are controlled with a controller (col. 1 lines 53-54, 59 to col. 2 lines 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the step of controlling electric current to the electrodes, as taught by Williamson, in the process of Watanabe et al. or Honma et al. and Chenoweth, in order to balance the temperature of the molten glass.

5. Claims 4, 6, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Honma et al. (JP Abstract 2001-002430) in view of Chenoweth (6,044,667) and Williamson (4,531,218), as applied to claims 1, 2, 3, and 8 above, and in further view of Ohama et al. (6,886,364). Honma et al. and Chenoweth do not teach a crucible having a diameter between 28 and 40 inches. Ohama et al. teach of a quartz glass crucible

with a diameter of 30 inches (col. 8 line 33). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the crucible size of Ohama et al. to produce silicon single crystals at improved yields.

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (JP Abstract 02-188489) or Honma et al. (JP Abstract 2001-002430) in view of Chenoweth (6,044,667) and Williamson (4,531,218), as applied to claim 13 above, and in further view of Ohama et al. (6,886,364). Watanabe et al., Honma et al., Chenoweth, and Williamson do not teach of a crucible having a diameter between 28 and 40 inches. Ohama et al. teach of a quartz glass crucible with a diameter of 30 inches (col. 8 line 33). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the crucible size of Ohama et al. to produce silicon single crystals at improved yields.

7. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Honma et al. (JP Abstract 2001-002430) in view of Chenoweth (6,044,667) and Williamson (4,531,218), as applied to claim 1 above, and in further view of Richards (5,364,426). Chenoweth disclose the option of using more than six electrodes (col. 9 lines 19-20), but fail to disclose specifically using nine electrodes with 3-phase current. Richards teaches an example for melting glass using nine electrodes in a ring-like configuration with applying 3-phase current to the electrodes (col. 13 lines 40-48). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the nine electrodes and 3 phase current of Richards in the process of Honma et

al., Chenoweth and Williamson in order to obtain the desired hot zone for melting the glass.

8. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Honma et al. (JP Abstract 2001-002430) in view of Chenoweth (6,044,667) and Williamson (4,531,218), as applied to claim 1 above, and in further view of Koontz (3,997,316) and Machlan (3,806,621). Chenoweth disclose the option of using more than six electrodes (col. 9 lines 19-20), but fail to disclose specifically using eight electrodes with 4-phase current. Koontz teaches melting glass with eight electrodes arranged in a ring-like configuration (col. 4 lines 55-57). Koontz also mentions using different currents of differing phases to accommodate the particular number of electrodes (col. 2 lines 16-20, but not specifically disclose using a four-phase alternating current. Machlan teaches using four-phase current to four electrodes used for melting glass (col. 3 lines 62-63, col. 4 lines 6-7, 13-15). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the eight electrodes of Koontz and four-phase current of Machlan in the process of Honma et al, Chenoweth, and Williamson, in order to achieve the high current densities for heating and melting glass, as taught by Machlan.

### ***Response to Arguments***

9. Applicant's arguments with respect to claims 1 and 13 have been considered but are moot in view of the new ground(s) of rejection.



***Conclusion***

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Queenie Dehghan whose telephone number is (571)272-8209. The examiner can normally be reached on Monday through Friday 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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